

# The New ACI 301, “Specifications for Structural Concrete”

The 2010 edition includes major additions

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BY W. CALVIN MCCALL

One of the many lessons that I’ve learned throughout my long career in concrete construction is that many of us do not read ALL the Project Specifications, much less the Reference Specifications, until there are problems; then, everyone reads ALL the specifications in detail, including the Reference Specifications. On some projects, the specifications become so critical that the construction team employs attorneys and consultants to thoroughly review each and every word in the specifications. ACI Committee 301 has just completed a comprehensive revision to the content of ACI 301. This revision expanded the scope of ACI 301 and revised many of the requirements that have been in previous versions for many years.

This is the first of three articles describing some of these changes. It covers the general changes to the added subjects in the document. The next article will discuss some of the modifications that the committee has made to many of the default requirements that have been in many previous versions. The third article will provide information on how the construction team should use ACI 301 when it’s referenced in Project Specifications. My hope is that these articles will provide an incentive and interest for reading ACI 301.

This article is Part 1 of a three-part series contributed for ACI Committee E707, Specification Education. The author is a member of ACI Committee E707 and was Chair of ACI Committee 301, Specifications for Concrete, during the writing and balloting of ACI 301-10.

The *American Heritage Dictionary*<sup>1</sup> defines specification as a detailed, exact statement of particulars, especially a statement prescribing materials, dimensions, and quality of work for something to be built, installed, or manufactured. ACI defines an ACI reference specification as a standardized mandatory language document prescribing materials, dimensions, and workmanship, incorporated by reference in Contract Documents, with information in the Mandatory Requirements Checklist required to be provided in the Project Specification.<sup>2</sup> A reference specification provides most of the detailed construction requirements that the Architect/Engineer (A/E) must convey to the Contractor.

ACI 301, “Specifications for Structural Concrete,”<sup>3</sup> is a reference specification for projects that are designed in accordance with ACI 318, “Building Code Requirements for Structural Concrete and Commentary,”<sup>4</sup> or ACI 349, “Code Requirements for Nuclear Safety-Related Concrete Structures and Commentary.”<sup>5</sup> In addition, ACI 301 provides requirements for concrete slabs-on-ground, even if they are not part of a structural system.

Building codes such as ACI 318 and ACI 349 should not be listed in the contract documents unless the A/E wants the contractor to design a part of the structure; therefore, specifications must provide the construction requirements that will meet the code requirements. ACI Committee 301 sought to create a document that would provide the default specifications for structures designed in accordance with ACI 318 or ACI 349, yet not require the Specifier to specify ACI 318 or ACI 349 in the contract documents.

Previous versions of ACI 301 covered specification requirements for general construction; the current version has added precast concrete and tilt-up concrete. These default requirements cover the specifications and/or the Contractor responsibilities for the code requirements in ACI 318 and ACI 349.

## SECTIONS

ACI 301-10 contains the following sections:

- Section 1—General requirements;
- Section 2—Formwork and formwork accessories;
- Section 3—Reinforcement and reinforcement supports;
- Section 4—Concrete mixtures;
- Section 5—Handling, placing, and constructing;
- Section 6—Architectural concrete;
- Section 7—Lightweight concrete;
- Section 8—Mass concrete;
- Section 9—Post-tensioned concrete;
- Section 10—Shrinkage-compensating concrete;
- Section 11—Industrial floor slabs;
- Section 12—Tilt-up construction;
- Section 13—Precast structural concrete; and
- Section 14—Precast architectural concrete.

The first five sections form the core requirements for most typical cast-in-place concrete structures and are to be used with all concrete construction projects. Sections 2, 3, and 4 provide requirements for formwork, reinforcement, and concrete mixtures that can be used in a variety of different applications. Section 5 contains requirements for handling, placing, curing, and finishing concrete.

Section 1 covers general requirements pertaining to the specification; delineates applicable and inapplicable portions of a structure; defines terms that are unique to the specification; and references four additional ACI standards, 112 ASTM standards, and 11 other documents. The referenced standards provide requirements for the tolerances, materials, and test methods cited in ACI 301-10.

## WHAT IS AGREED

It's important to realize that, by referring to ACI 301 in the Contract Documents, the A/E is agreeing to provide certain things to the Contractor, including timely approval of submittals and mockups. ACI 301 also states that the Owner will provide a testing agency that meets the requirements in ASTM C1077, to ensure that the testing agency is qualified to perform the work on the project

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and meets requirements for the Owner's testing agency. This is important because errors committed by the testing agency often cause lower test results, creating problems for the entire construction team.

The Owner's testing agency provides quality assurance to ensure the materials used on the project meet the specified requirements. The Contractor is required to provide the Owner's testing agency:

- Access to the project site;
- Exclusive space and electrical power needed for initial curing of concrete test specimens; and
- At least 24-hour notice of operations.

ACI 301 states that the Owner's testing agency will report results to the A/E, Owner, Contractor, and concrete supplier within 7 days of testing. ACI 301 also requires that the testing agency issues a report to these parties when it appears that furnished material or work is not in compliance with the Contract Documents.

ACI 301 has further requirements for the Contractor's testing agency, which will provide testing services:

- For qualification of proposed materials and establishment of concrete mixtures with the concrete supplier; and
- As needed or required by the Contractor to fulfill the quality control plan.

The Contractor's testing agency must be approved by the A/E.

## ACCEPTANCE

A critical part of the specification is Section 1.7, Acceptance of structure. This section informs the Contractor of the Owner's acceptance criteria, but more importantly it also provides certainty that the structure will be accepted if it meets requirements as stated in the specifications. The general basis for acceptance is that completed concrete work conforms to applicable requirements of ACI 301 and the Contract Documents. In general, conformance requires meeting specified:

- Dimensional tolerances;
- Appearance;
- Strength of structure; and
- Durability.

Dimensional tolerances are required to comply with ACI 117. Appearance requirements for formed and unformed concrete surfaces must be defined in the Contract Documents; finish requirements are listed in ACI 301. The strength of the structure can be affected by unsatisfactory concrete strength, out-of-tolerance dimensions, reinforcement at variance with the Contract Documents, or failure to meet curing requirements. The durability of the concrete work may be considered deficient if strength, materials, or other parameters are at variance with relevant sections of ACI 301.

If the Contractor constructs a structure meeting the requirements of the Contract Documents (including

ACI 301), the terms of the contract with the Owner have been met and payment should be made. If there are some items not meeting the requirements specified in the Contract Documents, these items should be evaluated to determine if they significantly impact the design intent for the structure.

## COMMUNICATION

ACI 301-10 is written in mandatory language to the Contractor. Committee 301 strove to make its reference specification as clear and concise as possible, with particular efforts taken to avoid misinterpretations. When the A/E incorporates ACI 301 in the Contract Documents, it can be construed that the requirements in ACI 301 are just as important as the requirements that are written in parts of the Contract Documents developed by the Owner. To avoid conflicts, ACI 301 uses key words or phrases in the following ways:

- The verb "shall" is used when a provision of this Specification requires action by the Contractor;
- The phrase "Either...or..." is used when the Contractor is allowed to exercise an option when limited alternatives are available;
- The verb "will" is used to provide statements in the specification as information to the Contractor;
- The verbs "may" or "will" are used in informational statements, typically to identify activities or options that "will be taken" or "may be taken" by the Owner or the Architect/Engineer;
- The phrase "Unless otherwise specified" is used when Committee 301 agreed that the default items may require modification by the A/E. If these terms were not used, there may be conflicts within the Contract Documents; and
- The phrase "Unless otherwise permitted" is used when Committee 301 agreed that the Contractor may want to ask for an alternative method. This would require a submittal by the Contractor and acceptance by the A/E.

## DOCUMENT STRUCTURE

ACI 301 is divided into two main portions: the specification and the checklists. The specification portion of ACI 301 is the only part that is written to apply to the Contractor. This portion contains the requirements to be used by the contractor to construct the structure, but it does not provide reasons or rationale for the requirements. The Contractor is contractually bound to follow the requirements.

The checklist portion provides instruction to the A/E, not the Contractor. Three checklists are provided:

- The Mandatory Requirements Checklist indicates work requirements regarding specific qualities, procedures, materials, and performance criteria that are not

defined in requirements in the Project Specification. This is used when there is not a default requirement in the specification;

- The Optional Requirements Checklist identifies A/E choices and alternatives. The Checklist identifies actions available to the A/E for specific articles within ACI 301-10. When the phrase “unless specified” is used in ACI 301, an optional checklist is generated to advise the A/E that he or she may need to specify alternative requirements; and
- The Submittals Checklist identifies information or data to be provided by the Contractor before, during, or after construction. This checklist includes items that are to be submitted to the A/E. It also includes submittal checklist items generated when the phrase “unless otherwise permitted” is used in ACI 301-10.

The A/E must specify the requirements in the Mandatory Checklists; however, the A/E should review each of the items in the Checklist and make adjustments in accordance with the needs of a particular project by including those selected alternatives as mandatory requirements in the Project Specification. The Optional Checklist may provide general information to the A/E to assist with choices, but the A/E should refer to specific ACI documents in selecting optional requirements or evaluating submittal items.

It’s very important for the A/E and the Contractor to become familiar with the requirements in ACI 301. With a thorough understanding of ACI 301, A/Es can avoid producing Contract Documents that arbitrarily incorporate nonmandatory documents by reference. Producing concise documents that take full advantage of ACI 301 will help avoid conflicting or ambiguous requirements that don’t serve the interests of the Owner, the Contractor, or the A/E.

### References

1. *American Heritage Dictionary of the English Language*, fourth edition, Houghton Mifflin Company, 2000.
2. TAC Specifications Committee, “ACI Specification Manual,” American Concrete Institute, Farmington Hills, MI, Mar. 2008, p. 2.
3. ACI Committee 301, “Specifications for Structural Concrete (ACI 301-10),” American Concrete Institute, Farmington Hills, MI, 2010, 77 pp.
4. ACI Committee 318, “Building Code Requirements for Structural Concrete (ACI 318-08) and Commentary,” American Concrete Institute, Farmington Hills, MI, 2008, 473 pp.
5. ACI Committee 349, “Code Requirements for Nuclear Safety-Related Concrete Structures (ACI 349-06) and Commentary,” American Concrete Institute, Farmington Hills, MI, 2006, 153 pp.

Note: Additional information on the ASTM Standards discussed in this article can be found at [www.astm.org](http://www.astm.org).

Selected for reader interest by the editors.



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